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# National Training Center, Joint Readiness Training Center, and Home Station-Based Research Program Products

Howard H. McFann and Richard K. Williams, Jr.

Editors

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ARI Field Unit at Presidio of Monterey, California  
Training Research Laboratory

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U.S. Army

Research Institute for the Behavioral and Social Sciences

April 1987

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19. ABSTRACT (Continue on reverse if necessary and identify by block number) This report presents a current summary of research products from the Army Research Institute National Training Center, Joint Readiness Training Center, and Home Station-Based Research Program. This research is a joint endeavor by the Army Research Institute (ARI) and the Combined Arms Training Activity (CATA). This integrated research program focuses on the development of a unit performance measurement system and determination of home-station predictors of unit performance effectiveness at the NTC. These elements are critical to the assessment of Army readiness and determination of needs related to doctrine, organizations, equipment, training, and soldier performance. This report describes research products that have been completed and provided to Army users, and ongoing research in support of the Center for Army Lessons Learned (CALL), the National Training Center Operations Group, and the Deputy Chief of Staff for Personnel.  Research has proven the usefulness of the training data derived from the NTC in analyzing Army issues and developing lessons learned. Research efforts are continuing to further refine the (Continued)					
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19. (Continued)

→ data collection procedures and develop a user-friendly data base more responsive to research needs.

FIG. 18

# **National Training Center, Joint Readiness Training Center, and Home Station-Based Research Program Products**

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ARI Research Reports and Technical Reports are intended for sponsors of R&D tasks and for other research and military agencies. Any findings ready for implementation at the time of publication are presented in the last part of the Brief. Upon completion of a major phase of the task, formal recommendations for official action normally are conveyed to appropriate military agencies by briefing or Disposition Form.

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## FOREWORD

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This report describes, in summary form, the research products developed from the Army Research Institute (ARI) National Training Center (NTC), Joint Readiness Training Center (JRTC), and Home Station-Based Research Program to date. This research, a joint endeavor between Combined Arms Training Activity (CATA) and ARI, focuses on the development of a unit performance measurement system and the determination of home-station predictors of unit performance effectiveness at NTC/JRTC. The research contributes to unit and leader training, as well as development and maintenance of force readiness.

The research task is entitled "Field Feedback from the National Training Center to Improve Collective and Individual Training." The research effort was conducted by the Presidio of Monterey Field Unit, whose mission is to increase Army unit combat performance capabilities by improving unit performance measurement and evaluation methods, unit training programs and management tools, and the NTC and home-station data base. Research was conducted under the terms of the Letter of Agreement "National Training Center (NTC) and Unit Home-Station Training and Feedback System," between CATA and ARI, dated 16 September 1985. CATA has used the products to include changes in doctrine and testing, and to modify CATA plans and programs. This compendium of documents is being maintained at CATA both as a key resource document and for archival purposes.

Results from these efforts have provided input for lessons learned, combat models, and responses to congressional inquiries. Research has provided information on requirements for instrumentation upgrading at NTC.

This report is organized into three major sections: completed products; draft reports; and research in process. An overview is presented for each section to depict the nature of the products, to describe the content, and to indicate utilization of information.

Appendixes are provided that categorize each product, describe the activity, summarize the utility of the information generated, and provide both user and ARI POC. Further information can be obtained on any activity reported by contacting either the user or ARI POC.



EDGAR M. JOHNSON  
Technical Director

NATIONAL TRAINING CENTER, JOINT READINESS TRAINING CENTER, AND HOME STATION-BASED RESEARCH PROGRAM PRODUCTS

EXECUTIVE SUMMARY

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Requirement:

The Army must be prepared to encounter a broad spectrum of potential conflicts with advance notice of deployment consisting of only days or even hours. To face this threat, the preparation of soldiers and their units must be maintained at the highest possible levels. There is thus a requirement to continuously train soldiers and units for combat; to instill a fighting spirit, loyalty, and unit cohesion; and to develop sound tactical doctrine and the leadership to fight and win. Optimization of the Army's capabilities can only be achieved by continuing rigorous evaluation of all factors contributing to its readiness posture. These factors include doctrine, equipment, organization, training status, and training support. Less tangible factors--which are hard to assess in peacetime but which experience has shown to be critical for success in war--include leadership, morale, values, and unit cohesion. Reliable and valid measurement of the performance of weapon systems, leaders, soldiers, and units, and of factors related to morale and motivation will provide guidance on areas where improvement is needed.

Procedure:

A current status of research efforts was obtained from all Army Research Institute (ARI) activities involved in the National Training Center (NTC)/Joint Readiness Training Center (JRTC)/Home Station-Based Research Program and verified with research sponsors. A summary of key products was compiled from the list of research projects completed, in draft form, and ongoing.

Findings:

Research has proven the utility of the training data derived from the NTC in analyzing Army issues and developing lessons learned. Additional data requirements have been identified for inclusion in the next programmed upgrade of the NTC instrumentation system. In addition, unit performance measurement system and operational procedures guides have been identified by users as important to the training feedback system at the NTC. Also, user needs have been incorporated into the development of an improved NTC data base.

Utilization of Findings:

Research results have provided input for analysis by Center for Army Lessons Learned (CALL), combat models, and responses to congressional inquiries. Research on the training data base revealed additional requirements for data collection to be incorporated into the next programmed instrumentation upgrade



at the NTC. Continued refinement of the existing data and development of a more comprehensive data base will enhance efforts to derive answers to key Army issues and analyze unit performance. Training support products exportable to schools and the NTC Operations Group will enhance training effectiveness.

NATIONAL TRAINING CENTER, JOINT READINESS TRAINING CENTER, AND HOME STATION-  
BASED RESEARCH PRODUCTS

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NATIONAL TRAINING CENTER, JOINT READINESS TRAINING CENTER,  
AND HOME STATION-BASED RESEARCH PRODUCTS

INTRODUCTION

Research products from or for the National Training Center (NTC), Joint Readiness Training Center (JRTC), Home Station Training, and the Combined Arms Training Activity (CATA) Lessons Learned Program are described below.

Information and data from all elements of the Advanced Collective Training Facilities (ACTF) are key elements in assessment of Army status and needs. CATA has been directed by the CSA and TRADOC to use information from the ACTF and other sources to continuously assess Army status and needs and to produce Lessons Learned for all elements of the Army. This knowledge of Army strengths and weaknesses truly becomes Lessons Learned when it is translated into sustainment or corrective actions by Army leaders, schools, and units. The knowledge will also support improvement of combat models and Army readiness assessment through incorporation of more complete and accurate information on human and organizational factors as well as weapons systems factors.

The Army Research Institute (ARI) has an Army-wide mission to improve Army capabilities through research and development on people-related factors in Army training, personnel, and systems. A Letter of Agreement between ARI and CATA identifies needs for measuring effectiveness of unit performance, enhancing effectiveness of NTC/JRTC and Home Station Training, and developing Lessons Learned methodologies. Activities in support of this mission have been grouped under five major task headings:

- o Lessons Learned: Collection and analyses of ACTF and Home Station Lessons Learned for training, doctrine, organizations, equipment, and soldier performance.
- o Unit Performance Measurement System: Development of methods and techniques to support training at NTC/JRTC and Home Station.
- o System Integration of Home Station and ACTF: Integration of leadership, training, and cohesion at Home Station and ACTF to develop and sustain combat readiness.
- o Support of Training: Development of procedures and methodology to assist NTC/JRTC and Home Station Training, and to generate training guidance.
- o Data Quality and Utility: Acquisition and structuring of NTC and JRTC training-oriented data to enhance the quality and usefulness of the data for conduct of secondary analyses.

An integrated Institute-wide program has been established to conduct the research required in these task areas. Major R&D requirements which are to be met by the program are:

- o Development of unit combat performance effectiveness criterion variables;
- o Development of unit task performance measures;
- o Development of Leader performance measures;
- o Development of predictors of unit performance;
- o Development of Lessons Learned methodologies;
- o Development of training alternatives and approaches to enhance combat preparation.

## OVERVIEW

Completed Products: This following compendium of products provides an overview of the activities jointly undertaken by ARI and CATA to employ the data available from the NTC to generate lessons learned for improvement of Army training and operations. CATA has used some of this information to respond to congressional inquiries. Research encompasses impact of leader performance on mission success; comparison of weapon system performance at NTC; training concepts for exporting lessons learned material from NTC; and, training guides and materials for training personnel at NTC. Considerable work has focused in improving measurement procedure, collection of data and processing of data to permit increased flexibility, efficiency and effectiveness in obtaining information needed for the lessons learned program.

### Description of Key Products:

#### Leader Performance:

- o Impact of platoon leader and platoon sergeant performance on tactical mission accomplishment at NTC.

#### Weapon System Comparison:

- o Comparison of BFVS and M113 equipped battalion task forces on live fire performance at NTC. Used by the BFVS Ad Hoc Working Group at Fort Irwin to respond to congressional inquiry.

#### Training:

- o An instructional guide on the De Anza Graphics display for training new analysts of the TAF at NTC.
- o An advanced users guide on realtime control of the NTC workstation employed to train newly assigned CIS personnel.

#### Measurement:

- o Specification of user data requirements to include a basis for integration of data requirements of all users of NTC information. Information supplied to DART for NTC instrumentation system upgrade.
- o The Electronic Clipboard, a hand-held, field portable, battery operated computer unit, was designed and a prototype successfully tested. The device facilitates the standardization and collection, storage, and entry of training guidance and evaluation data to large automated training management systems.

Products in Draft Form: Research continues to derive lessons learned from the NTC in support of CALL. Current draft reports focus on the performance of weapon systems at the NTC. An analysis of the performance of tank platoons in 10 defensive missions examines the relationship between the effectiveness of tank platoons and such factors as ranges of engagements and volume of fire.

Another series of reports analyze the performance of weapons systems such as tanks, TOWs, and OPFOR weapons. Performance differences based on type mission, type unit, training area, time of year, and length of time into the rotation are examined. Results will be useful to schools, combat modelers, and NTC Operation Group trainers as well as researchers developing an improved NTC digital data base.

#### Description of Key Reports:

Ranges of Engagement and Effectiveness of Tank Platoons in a Defensive Mission at the NTC.

- o Analyzes tank platoon effectiveness in terms of hits, kills, and near misses.
- o Analyzes tank platoon effectiveness based on frequency of firings and ranges of engagement.
- o Preliminary results indicate the efficiency of tank platoons (kills/rate of fire) is relatively constant across ranges.

#### Performance of Individual Weapons Systems at the NTC

- o Analyzes weapon system effectiveness in terms of hits, kills, and near misses.
- o Compares impact of type mission, type unit, training area, time of year, and length of time into rotation on effectiveness.
- o Preliminary findings indicate only type mission and training area are important.

Ongoing Research: Future research efforts will continue to focus on the unit performance measurement system, development of the improved NTC data base, the NTC feedback system, and support of the Army's lessons learned program. Measures for critical task performance and mission effectiveness at the NTC will be developed as the key elements of the unit performance measurement system which will facilitate analysis of NTC data. In addition, a major effort to examine the effect of home station factors on performance at the NTC will be started shortly. Home station data will be correlated with performance at the NTC on critical tasks and mission effectiveness to identify strengths and weaknesses concerning tactical doctrine, training, equipment, leadership, and personnel issues. Also, in an effort to keep abreast of the Army's expansion of training facilities, a revised Letter of Agreement between ARI and CATA will include JRTC and CMTC.

An improved NTC research data base will be developed to incorporate both digital and paper-based data. Once the digital data base design is finalized in February 1987, extant digital data will be downloaded. Paper-based data will be digitized for ease of archiving and preliminary methods for accessing critical information will be developed. This improved data base will be more responsive to the needs of researchers and Army sponsors and capable of expanding with new technology.

Feedback at the NTC provides the crucial link between trainers and units. Research efforts will analyze user requirements, developmental procedures, and the content of After Action Reviews (AAR), Take Home Packages (THP), and NTC Observer/Controller (OC) responsibilities to identify recommendations for improving content and structure. Documentation of OC responsibilities for the Commander, NTC Operations Group, will facilitate training new personnel and will provide a valuable tool for use by OCs in the field. In addition, an improved Electronic Clipboard will be developed and tested in coordination with NTC, and JRTC OCs. This technological innovation should operationalize the unit performance measurement system, ease observational procedures, and improve the quality of feedback provided by the OC.

Support of the lessons learned program will include technical assistance to selected focused rotation studies and continued response to Army priority issues. Methods will be developed for use by researchers, CALL staff officers and TRADOC school proponents in planning and executing focused rotation studies. Furthermore, support of priority issues will identify user needs for incorporation into the data base and facilitate long term analysis.

#### Description of Key Products:

##### Mission Effectiveness Measurement System

- o Doctrinally-based unit performance standards keyed to factors of METT-T at the NTC.
- o Provides NTC performance effectiveness criterion for use by O/C to perform their tasks and for analysis predictor variables.

##### Task Performance Measurement System

- o Identifies tasks, conditions and standards for tasks critical to performance at the NTC.
- o Provides performance measures for these tasks.
- o Correlation with mission performance and home station factors will reveal strengths and weaknesses.
- o Developmental methodology will be useful in future ARTEP-AMTP production.

##### Utilization of NTC Take Home Packages by Units at Home Station

- o Identifies primary users and potential users of information from the NTC, and how the information is used.
- o Recommendations for improvements will be developed.

##### Leadership Survivability at the NTC

- o Analyzes the incidence and circumstances surrounding leader losses at the NTC.

- o Results will provide insight concerning leader positioning on the battlefield and any performance trends following leader loss.

#### Killer Tank Crews at the NTC

- o Examines volume and consistency of BLUEFOR tank performance across missions.
- o Results will facilitate examination of contributing factors to successful tank crew performance.



APPENDIX A  
COMPLETED PRODUCTS

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## APPENDIX A

### COMPLETED PRODUCTS

#### 1. THE ARMY RESEARCH INSTITUTE PLAN FOR AN NTC, JRTC, AND HOME STATION-BASED RESEARCH PROGRAM.

Description: ARI has Army-wide responsibility for research and development on soldier issues facing the Army. This plan describes the seven-year program to execute ARI's responsibility in support of Army training at NTC/JRTC and Home Station, as well as the production of Lessons Learned for personnel selection, assignment, and training; unit cohesion and values; organization; and tactical doctrine. The Plan is designed to meet the needs of a variety of research sponsors including the Deputy Chief of Staff for Personnel, the Combined Arms Training Activity and the Center for Army Leadership (CAL) at Fort Leavenworth, and the Concepts Analysis Agency. The Plan includes major Letters of Agreement with sponsors, major R&D requirements which are to be met by the program, and a large number of specific projects, with milestones, to achieve the research and Army objectives.

Utilization: This Plan documents the agreements of ARI and its research sponsors and provides the basis for continued coordination of research to keep it responsive to Army priorities and needs.

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. Jack Hiller, ARI ACTF Research Coordinator, AV 284-8815

#### 2. LESSONS LEARNED.

##### a. Lessons from the NTC: Common Battalion Task Force Training Needs

Description: An analysis of Battalion Task Force performance at the NTC, using information from NTC Take Home Packages. Systemic strengths and weaknesses are identified. In most cases the weaknesses in the execution of doctrinally-correct actions were found to be fundamental and not due to the characteristics of the NTC training environment.

Utilization: The results have implications for training, doctrine, organization, materiel, logistics, readiness, and R&D requirements. Provided to CATA for use in Lessons Learned and in combat models.

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. James Banks, AV 878-5316

##### b. Lessons From NTC

Description: This report presents lessons digested from products of the NTC training and instrumentation system and reports of combat training experience

from commanders and staffs. Provides the first comprehensive set of lessons learned from the NTC.

Utilization: Currently being used as the basis for a series of CALL newsletters on NTC Lessons Learned.

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. Nancy Atwood, AV 878-5619

c. Comparison of the BFVS and M113 Equipped Battalion Task Forces on Live Fire Performance at the National Training Center

Description: This report presents an initial analysis of the contribution of the Bradley Fighting Vehicle System (BFVS) to the effectiveness of the U. S. Army Heavy Task Force.

Utilization: This document provides a performance comparison of the M113 and BFVS at the NTC, which was used by the BFVS Ad Hoc Working Group at Fort Irwin to respond to Congressional inquiry.

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. Nancy Atwood, AV 878-5619

d. An NTC Live Fire Performance Analysis

Description: This report presents an exploratory data analysis of the performance of battalion task forces on the live fire range at the NTC.

Utilization: Provides a baseline for task force performance on the live fire range at the NTC

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. Nancy Atwood, AV 878-5619

e. A Preliminary Analysis of NTC Force-on-force Performance

Description: This report provides an initial assessment of task force performance in force-on-force simulation at the NTC.

Utilization: Provides an initial look at the performance patterns of engagement simulation exercises at the NTC

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. Nancy Atwood, AV 878-5619

f. NTC Leadership Lessons Learned

Description: This report was developed for use by Army leaders training for the challenges on the modern battlefield. It is divided into two parts. The first part reviews the leadership challenges of the modern battlefield and

provides a summary of findings from leadership research at the NTC. The second part is basically a training package for use in leaders development. Specific suggestions on how the leadership vignettes might be used in leader development are included.

Utilization: Provided to CATA for use in Lessons Learned. Wider distribution is now under review by TRADOC.

User POC: CAL (MAJ S. Endicott, AV 552-2793)

ARI POC: Dr. Truman Tremble, AV 284-8293

g. The Platoon Leader-Platoon Sergeant Relationship in a Tactical Environment: Focused Rotation at the National Training Center (NTC)

Description: This report describes preliminary findings from data collected at the NTC that show the impact of the leadership performances of and relationships between platoon leaders and platoon sergeants on the mission accomplishment of their platoons.

Utilization: The findings were supplied to the Combined Arms Training Activity, NTC Lessons Learned, as a basis for derivation of leadership lessons learned. The data collection instruments, after additional refinement, could be routinely applied to standardize the operating procedures of the NTC observer/controllers.

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. Truman Tremble, AV 284-8293

h. National Training Center Performance Trends for the Maneuver Operating System: Relationship to Training Doctrine

Description: Detailed analyses of trends from NTC Unit Take Home Packages, with linkage to ARTEP tasks. Identifies recurring areas of strength and weakness in the performance of units at the NTC. Provides guidance for design of Take Home Packages to improve their usability for home station NTC train-up and for post-NTC corrective and sustainment training.

Utilization: Provided to CATA for use in Lessons Learned.

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. James Banks, AV 878-5316

i. National Training Center Performance Trends for Mortar Fire Support: Relationship to Training Doctrine

Description: Detailed analyses of trends from NTC Unit Take Home Packages, with linkage to ARTEP tasks. Identifies recurring areas of strength and weakness in the performance of units at the NTC. Provides guidance for design of Take Home Packages to improve their usability for home station NTC train-up and for post-NTC corrective and sustainment training.

Utilization: Provided to CATA for use in Lessons Learned.

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. James Banks, AV 878-5316

j. Observations from Three Years at the NTC, by COL Larry Word

Description: Edited report from videotape of two-and-a-half-day debriefing of COL Word just prior to his reassignment as Director, Joint Readiness Training Center. Provides COL Word's observations and recommendations on home station preparation for the NTC, National Guard performance at the NTC, and recurring areas of strength and weakness in leader and unit performance at the NTC.

Utilization: Provided to CATA for use in Lessons Learned.

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. James Banks, AV 878-5316

k. Observation Guides for NTC Focused Rotation on Leadership

Description: The observation guides are a set of instruments used for observing and measuring leader behavior on the ground at NTC.

Utilization: The product was used in an investigation for CATA of leadership at the platoon level, and may also be used by O/C's at NTC to record observations of leader behaviors for use in AARs.

User POCs: CATA (LTC Coon, AV 552-2438); O/C's at NTC (LTC Helmgartner, AV 470-5083)

ARI POC: Dr. Nancy Atwood, AV 878-5619

l. A Survey Comparing the M2/3 Bradley Fighting Vehicle and the M113 Armored Personnel Carrier, by Members of the NTC Operations Group and OPFOR

Description: Observations and opinions of NTC personnel on the relative effectiveness of the M2/3 BFVS and the M113 Armored Personnel Carrier.

Utilization: Used by CATA in response to Congressional inquiries on the M2/3.

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. James Banks, AV 878-5316

m. A Method of Analysis for the Bradley Fighting Vehicle at the National Training Center

Description: This detailed method of analysis is a comprehensive plan for addressing the issues of the performance of the BFVS at the NTC.

Utilization: Methodology was provided to and used by the Ad Hoc Working Group at Fort Irwin for collection and use of NTC data to evaluate the BFVS performance at the NTC as part of response to Congressional inquiry.

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. Nancy Atwood, AV 878-5619

n. An Evaluation of Training and Research Potential at the National Training Center

Description: This report describes the National Training Center--its components, their organization, functioning, etc.--to provide a framework for further research involving either on-the-ground data collection or analysis of the NTC data archives.

Utilization: This report provides researchers an information base for research planning. The knowledge gained in collecting and integrating information for the report guided subsequent ARI efforts.

User POC: CAL (MAJ S. Endicott, AV 552-2793)

ARI POC: Dr. Truman Tremble, AV 284-8293

o. Development of a Leader Lessons Learned Methodology

Description: This report describes a methodology for deriving leader lessons learned from existing take-home packages and After Action Review tapes produced during training exercises at the National Training Center. The methodology can be used by researchers and tactical subject matter experts for deriving lessons about tactical engagement and leadership.

Utilization: Provided to CATA for use in Lessons Learned and development of the TRADOC training support products. The lessons learned from application of the methodology could help to establish training objectives and scenarios for leader training at either home station or the advanced training facilities. The tactical performance assessment guide, developed as part of this effort, is an input to development of standardized procedures for observer/controller personnel at the NTC.

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. Truman Tremble, AV 284-8293

p. Training Materials for Use of Leader Observation Guides

Description: These materials are instruction aids to assist SMEs in preparing to collect data on leader behaviors at NTC

Utilization: The materials were used in a workshop to train SMEs in the use of the "Observation Guides for NTC Focused Rotation on Leadership." The materials may also be used to train O/C's at the NTC if they should use the Observation Guides.

User POCs: CATA (LTC Coon, AV 552-2438); NTC Operations Group (LTC Heimgartner, AV 470-5083)

ARI POC: Dr. Nancy Atwood, AV 878-5619

q. An Evaluation of the Acoustic Quality and Research Potential of Communications Recordings from the National Training Center

Description: This assessment of the quality of communications from the NTC found that recorded communication provides a rich source of information for a variety of research efforts, especially in the areas of leadership, communications, and command and control. However, the report identified problems in use of the tapes and recommended changes that would improve the quality of recorded communications for training and research purposes.

Utilization: Has been used by researchers to design analysis of communications. Also, the report provided information for defining needs incorporated in planning the system upgrade of the NTC.

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. Truman Tremble, AV 284-8293

r. Research Support Plan for NTC 87-5 Focused Rotation - Force Modernization

Description: A plan for providing technical support to the CALL Action Officer

Utilization: Plan approved by CALL and now in execution phase.

User POC: CATA (CPT Vance, AV 552-2191)

ARI POC: Dr. Nancy Atwood, AV 878-5619

s. Research Plan for ARI Support on NTC Focused Rotations 87-6 and 87-8

Description: A plan for providing technical support to the CALL Action Officer.

Utilization: Plan approved by CALL and now in execution phase

User POC: CATA (MAJ Porter, AV 552-2191)

ARI POC: Dr. Nancy Atwood, AV 878-5619

t. National Training Center Research Issues

Description: This report presents a framework for issue identification specifically for the National Training Center (NTC).

Utilization: Has served as a methodology and framework for the identification and investigation of researchable NTC issues

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. Nancy Atwood, AV 878-5619

### 3. UNIT PERFORMANCE MEASUREMENT SYSTEM.

#### a. A Research Concept for Developing and Applying Methods for Measurement and Interpretation of Unit Performance at the National Training Center

Description: This document describes a methodology for identifying and measuring critical tasks performed by battalion task forces at the NTC and the resultant effect on mission results

Utilization: This product is being used to guide the research effort in accomplishing the task of identifying and measuring NTC mission critical tasks. Briefed to CATA Commander who directed use of methodology for future ARTEP/AMTP development by Training Integration Directorate

User POC: ARI/CATA/NTC/U.S. Army (LTC Coon, AV 552-2438)

ARI POC: Dr. Nancy Atwood, AV 878-5619

### 4. SYSTEMS INTEGRATION OF HOME STATION AND ACTF

#### a. Research Plan for the Evaluation of the Requirements for the Effective Integration of the National Training Center (NTC) and Home Station Training

Description: This document presents a Test Concept for the investigation of the effective integration of unit home station and NTC training.

Utilization: Served as basis for data collection effort at Fort Knox during summer and fall 1986.

User POC: ARI

ARI POC: Dr. Nancy Atwood, AV 878-5619

#### b. MILES Training Checklist

Description: Guide for unit trainers on preparing, monitoring, and reviewing training with MILES. Directed at home station train-up for the NTC.

Utilization: Distributed by the Combined Arms Training Activity to CONUS divisions with letter from CDR, CATA stressing importance of MILES in train-up for the NTC. To be distributed Army-wide as GTA by the Army Training Support Center.

User POCs: CATA (LTC Coon, AV 552-2438); Director-Tactical Engagement Simulation (Mr. Tallman, AV 927-4631)



ARI POC: Dr. James Banks, AV 878-5316

5. SUPPORT OF TRAINING.

a. Documentation for "What Now, Captain?": A Training Concept for Exporting Lessons Learned From the National Training Center

Description: The "What Now, Captain?" training concept involves the utilization of all NTC data sources (audio, video, and digital) in the preparation of short video vignettes based on real NTC missions. Demonstrated in videotape and documented in ARI Research Note.

Utilization: Briefed at TRADOC Commander's Conference by CATA Commander. TRADOC Commander directed preparation of two tapes on Principles of Offense and Defense. Provides a training concept that would export NTC experiences and lessons to FORSCOM units.

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. Nancy Atwood, AV 878-5619

b. The De Anza Primer: A Basic Introduction to the De Anza Graphics Display

Description: The DeAnza Primer provides personnel newly assigned to the Training Analysis and Feedback (TAF) Section of the NTC Operations Group with a training tool for learning the routine skills needed to operate the DeAnza Graphics Display.

Utilization: Is an instructional guide to the use of the NTC replay station for training new analysts of the TAF at the NTC

User POC: NTC Operations Group (LTC Haugen, AV 470-4281)

ARI POC: Dr. Nancy Atwood, AV 878-5619

c. A Detailed Description of the National Training Center Instrumentation System Initialization Procedure

Description: This report presents a detailed description of the Instrumentation System Initialization Procedure that occurs at the start of each National Training Center (NTC) training unit rotation.

Utilization: Establishes a management resource for the documentation of the steps necessary for system initialization at the NTC.

User POC: NTC Operations Group (LTC Haugen, AV 470-4281)

ARI POC: Dr. Nancy Atwood, AV 878-5619

d. Interview Guide: Unit Home Station Training and Feedback Guide

Description: An interview protocol for the collection of information concerning the utility of NTC data for use at home station

Utilization: Employed in collecting information during pilot research.

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. Nancy Atwood, AV 878-5619

e. After Action Review Guidebooks:

- (1) Tactical Engagement simulation After Action Review Guidebook
- (2) After Action Review Guidebook I: National Training Center
- (3) After Action Review (AAR) Guide for ARTBASS

Description: Methods for conducting After Action Review for Home Station, NTC, and ARTBASS training exercises.

Utilization: Provided to Director-Tactical Engagement Simulation, TSM-NTC, and ARTBASS trainers.

User POC: Director-Tactical Engagement Simulation (Mr. Tallman, AV 927-4631)

ARI POC: Dr. James Banks, AV 878-5316

f. Concept Study for a Computer-aided ARTEP Production System (CAPS)

Description: Concept for using computer technology to facilitate rapid, effective preparation and revision of ARTEP Mission Training Plan and Drill documents.

Utilization: Used as guidance for bidders on a follow-on contract, funded by the Army Training Board, to develop a CAPS within the U.S. Army Infantry School. Used as input for the procurement of off-the-shelf hardware/software to support CAPS development.

User POCs: U.S. Army Training Board (ATB) (LTC Salgado, AV 680-4353)  
U.S. Army Infantry School (USAIS) (Dr. Jean Dyer, AV 835-3022)

ARI POC: Dr. Dwight Goehring, AV 878-5308

g. ARTEP Mission Training Plan (AMTP)/Drill Feedback Survey

Description: Results of survey of users of prototype AMTP and drill documents prepared by nine branch schools.

Utilization: Requested by the U.S. Army Training Board as input for revision of TRADOC Reg 310-2, "Design, Development, Preparation and Management of ARTEP Mission Training Plans (AMTPs) and Drills."

User POC: ATB (CPT Lavender, AV 680-4375)

ARI POC: Dr. Dwight Goehring, AV 878-5308

h. Defining Roles in the Development of a Computer-aided ARTEP Production System (CAPS)

Description: Describes updates in CAPS design concept made to ensure compatibility with the TRADOC Command Management Information System (TCMIS) training module and take advantage of interpolated advances in technology. Defines research issues to be addressed during each of the ten tasks involved in developing a CAPS, and defines role of each participating organization within each task.

Utilization: Used by POCs to manage their organizations involvement in CAPS development.

User POCs: USAIS (Dr. Jean Dyer, AV 835-3022)  
ATB (Dr. Larry Brown, AV 680-4357)  
US Army Training Support Center Information Management Office (Mr. Bill O'Dell)

ARI POC: Dr. Dwight Goehring, AV 878-5308

i. A Cost-effective Approach to AMTP/Drill Preparation

Description: Uses intuitive judgments by SMEs as tools in efficiently developing a collective task data base which effectively supports AMTP/Drill preparation, replaces abstract guidance for applying AMTP/Drill concepts with more concrete rules of thumb defined in terms of collective task data base components.

Utilization: Input for CAPS functional requirements and data base design.

User POC: USAIS (Dr. Jean Dyer, AV 835-3022)

ARI POC: Dr. Dwight Goehring, AV 878-5308

j. The Advanced User's Guide to Realtime Control of the NTC Workstation

Description: A Hands-on training manual providing instruction for realtime operation/instrumentation system interaction

Utilization: Currently being used to train newly assigned CIS personnel on NTC workstation operation

User POC: NTC Operations Group (LTC Haugen, AV 470-4281)

ARI POC: Dr. Nancy K. Atwood, AV 878-5619

## 6. DATA QUALITY AND UTILITY.

### a. Training and Lessons Learned Data Requirements from the National Training Center

Description: Data requirements from the NTC for training and lessons learned are specified for each of the seven operating systems. These requirements were generated by a working group to improve the quality of NTC data. The importance of synchronizing data sources and of acquiring additional technology was stressed.

Utilization: This report provides the basis for integration of data requirements from all users of NTC information. The integrated requirements have been supplied to the Directorate of Army Ranges and Targets (DART) which is responsible for a planned NTC instrumentation system upgrade.

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. James Banks, AV 878-5316

### b. The Electronic Clipboard System

#### (1) The Electronic Clipboard

Description: A hand-held, field portable, battery-operated computer unit designed to facilitate the collection, storage and entry of training guidance and evaluation data to a larger automated training management system. (See videotape).

Utilization: Prototype successfully tested at Fort Knox. Prototype and field test results briefed to TRADOC Commander who supported Army-wide fielding. Requested for use by Commanders of Advanced Combined Arms Training Facilities (National Training Center, Joint Readiness Training Center).

#### (2) Phase II TIMS Utilization Documentation Training Base Station (TBS) User's Manual

Description: A manual for users of the larger automated training management system designed for use in conjunction with the Electronic Clipboard.

Utilization: Manual successfully tested at Fort Knox. Prototype and field test results briefed to TRADOC Commander who supported Army-wide fielding. Requested for use by Commanders of ACTF (NTC, JRTC).

#### (3) Phase II TIMS Utilization Documentation Electronic Clipboard Subsystem (ECS) User's Manual

Description: A manual for users of the Electronic Clipboard providing necessary information and instructions for all operating modes.

Utilization: Manual successfully tested at Fort Knox. Prototype and field test results briefed to TRADOC Commander who supported Army-wide fielding. Requested for use by Commanders of ACTF (NTC, JRTC).

User POCs: CATA (LTC Coon, AV 552-2438)  
JRTC (COL Word, AV 680-3798)  
NTC Operations Group (LTC Haugen, AV 470-4281)

ARI POC: Dr. Nancy Atwood, AV 878-5619

c. ARI-POM Data Base Development Plan

Description: This document is a plan for the development of an enhanced NTC database system for ARI-POM and others with interest in NTC research/analysis

Utilization: The document lays out the database process from specification through design to the final product

User POC: ARI/CATA (LTC Coon, AV 552-2438)  
Rand Arroyo Center, (213) 393-0411

ARI POC: Dr. Nancy Atwood, AV 878-5619

d. Research Plan for Rule Based Data Reduction

Description: A plan for reducing and summarizing NTC paper-based data (such as OPORDs, Take Home Packages) using automated techniques.

Utilization: Coordination with CALL and now in execution phase

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. Nancy Atwood, AV 878-5619

e. Comparison of National Training Center Digital Data Sources

Description: This report provides an introduction to the Range Data Measurement Subsystem (RDMS) log data from the National Training Center (NTC) and it provides a comparison of the two NTC digital data sources, Core Instrumentation Subsystem (CIS) log tapes and RDMS log tapes.

Utilization: Provides an assessment of the relative contribution of the two digital data sources for use.

User POC: CATA, (LTC Coon, AV 552-2438)

ARI POC: Dr. Nancy Atwood, AV 878-5619

f. Capability to Analyze NTC Data

Description: This report documents the status of the capability of the Army Research Institute, Presidio of Monterey (ARI-POM) to utilize digital data from the National Training Center (NTC) to fulfill its mission of research into training implications of NTC performance.

Utilization: Provides an initial assessment of the database at ARI-POM to support research and lessons learned

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. Nancy Atwood, AV 878-5619

g. NTC Data Handbook

Description: Reviews NTC data gathering procedures; describes digitized, audio, and video information collected from engagement simulation and live fire exercises at the NTC; and discusses these data in terms of their calculation and display on the NTC Work Station.

Utilization: Widely distributed to military and research personnel to acquaint them with the characteristics and capabilities of the NTC instrumentation system.

User POC: Numerous Army Agencies

ARI POC: Dr. James Banks, AV 878-5316.

h. NTC Data Library

Description: The primary purpose of this report is to describe the materials present at ARI-POM and to describe security, procedures, and current data processing routines. Provides a history of the establishment of the NTC library, including a request for ARI-POM to serve as an archive for NTC data.

Utilization: Working tool for researchers.

User POC: ARI

ARI POC: Dr. Nancy Atwood, AV 878-5619

i. National Training Center Lessons Learned: Data Requirements

Description: This report summarizes the results of a meeting held by the working group to improve NTC data. It also summarizes previously identified user needs. Recommendations are made for improving data collection techniques and quality of the data.

Utilization: This report documents discrepancies between user needs and current data collected at the NTC. It facilitated discussion of improvement of the data. With its appendices, it is a complete record of user needs, current state of data collection, and needed improvements. It was used as input for development of an integrated set of data requirements.

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. James Banks, AV 878-5316

j. Program GDETAP Documentation in Data Base Development

Description: This report provides documentation of the tape-reading program GDETAP. Which provides the necessary software to access the RDMS data from the NTC

Utilization: Working tool for researchers.

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. Nancy Atwood, AV 878-5619

APPENDIX B  
PRODUCTS IN DRAFT FORM

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APPENDIX B  
PRODUCTS IN DRAFT FORM

2. LESSONS LEARNED

a. Ranges of Engagement and Effectiveness of Tank Platoons in a Defensive Mission at the NTC

Description: An analysis of the performance of tank platoons in Defend from a Battle Position missions at the NTC. The analysis will use NTC digital data. Measures will include ranges of engagement, rounds fired, and near misses, hits, and kills.

Utilization: Army schools and the modeling community have requested this information. It also provides information for Lessons Learned and methods for improved unit feedback in After Action Reviews and Take Home Packages.

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. James Banks, AV 878-5316

b. Performance of Individual Weapons Systems at the NTC on:

BLUE TANK  
TOW  
OPFOR TANK  
FRATICIDES  
SAGGER

Description: This series of reports will describe the performance of various weapon systems in terms of hits, kills, and near misses at specific range bands. They will determine how performance is affected by type of mission, type of unit, training area, time of year, and length of time into the rotation.

Utilization: These reports are in response to requests from Army schools, modeling agencies, and combat development agencies. They will help to improve and validate combat simulations.

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. James Banks, AV 878-5316

3. UNIT PERFORMANCE MEASUREMENT SYSTEM.

a. The Criterion Problem: A Practical Solution for Research Based on Unit Performance at the National Training Center (NTC).

Description: Clarifies issues and describes research approach in examining unit performance. Discusses obstacles to combat effectiveness measurement and limitation of NTC data; provides examples of unit performance standards and criterion variables; and recommends subjective and objective measures. Future prospects include combat simulation such as Simulator Network (SIMNET).

Utilization: Will serve as guide for development of Unit Performance Measurement System and integration into future simulation technology.

User POC: ARI/CATA (LTC Coon, AV 552-2438); DARPA

ARI POC: Dr. Jack Hiller, AV 284-8622

## 6. DATA QUALITY AND UTILITY

### a. NTC Tactical Data Base Preliminary Design

Description: Documents the table structure and contents of the NTC tactical data base.

Utilization: Provided to researchers as a strawman and will be revised to incorporate users' changes and as input to the detailed design effort.

User POC: ARI/CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. Nancy Atwood, AV 878-5619

APPENDIX C  
ONGOING RESEARCH

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APPENDIX C  
ONGOING RESEARCH

1. CURRENT ACTIVITIES.

Research continues on the unit performance measurement system, development of the improved NTC data base, and documentation of the OC procedures for the Commander, Operations Group. Research support for selected focused rotations is also being provided to the CALL project officers. Reviews of contract proposals concerning the determinants of performance at the NTC have recently been completed. Upon award of this five year effort, home station data collection will begin which will allow the examination of the effect of home station factors on performance at the NTC. In addition, the existing LOA with CATA is being modified to encompass JRTC.

1. ARI Plan for an ACTF Home Station-based Research Program: The ARI program is being expanded to cover all elements of the ACTF including not only the NTC but also the JRTC and the European Training Center (when it is established).

ARI/CATA meetings have been held to ensure integration of CATA's high priority issues into ARI's near-term research program and to define and expand the focus of the long-term program. Arrangements are being made to provide ARI direct support to the JRTC and to incorporate JRTC data into the integrated data base at the Presidio of Monterey Field Unit. Direct support of training at the NTC is also being increased. The ARI/CATA Letter of Agreement (LOA) is being revised to cover research in support of Lessons Learned and training for all elements of the ACTF.

ARI is initiating a major effort to investigate Home Station factors related to performance at the NTC. The data from this investigation will be incorporated into the integrated data base at Monterey and analyzed to identify home-station determinants and predictors of performance at the Training Centers. These analyses are expected to have major implications for changes in Army policy and training to improve combat readiness.

Agreements have been reached among CATA, Rand Arroyo Center (AC) and ARI for ARI to provide AC with the loaded data base as it is developed, for AC's analyses and applications.

A synopsis of work in progress is contained in the following sections. Efforts are collated under the same five major task headings employed for Part A: Work Accomplished

2. LESSONS LEARNED.

a. Leadership Survivability at the NTC

Description: A report on the incidence and circumstances surrounding leader losses at the NTC.

Utilization: Will be used by CALL to address issues surrounding leader performance at the NTC

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. Nancy Atwood, AV 878-5619

b. Killer Tank Crews at the NTC

Description: A report on the volume and consistency across missions of OPFOR kills by individual BLUEFOR vehicles at the NTC

Utilization: Will be used by CALL to identify high performing tank crews so that contributors to success at the NTC can be investigated

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. Nancy Atwood, AV 878-5619

c. Data Collection Instruments on Force Modernization

Description: Observer guides, interview protocols, and questionnaires for gathering information on impacts of force modernization

Utilization: Will be used by SME's to collect data for NTC Focused Rotation 87-5.

User POC: CATA (CPT Vance)

ARI POC: Dr. Nancy Atwood, AV 878-5619

d. Data Collection Instruments on NBC Operations

Description: Observer guides, interview protocols, and questionnaires for gathering information on NBC Operations

Utilization: Will be used by SME's to collect data for NTC Focused Rotation 87-6

User POC: CATA (MAJ Porter, AV 552-2191)

ARI POC: Dr. Nancy Atwood, AV 878-5619

3. UNIT PERFORMANCE MEASUREMENT SYSTEM.

a. Mission Effectiveness Measurement System

Description: Doctrinally-based unit performance standards keyed to friendly and enemy conditions at the NTC (missions, troops available, terrain, time available [METT-T]), with associated performance measures.

Utilization: Provides the NTC performance effectiveness criterion variable to be correlated with performance on critical tasks and with Home Station

factors. Needed to identify the strengths and weaknesses in tactical doctrine, training, leadership, and systems. Development methodology can be used in production of ARTEPs/AMTPs. Will be employed as model for JRTC measurement system.

User POC: ARI/CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. Nancy Atwood, AV 878-5619

b. Task Performance Measurement System

Description: Detailed task analysis for NTC missions and conditions. Identifies tasks, conditions, standards and associated performance measures for all elements of the task force.

Utilization: Provides the NTC task performance measures for use in NTC feedback. To be correlated with mission performance and Home Station factors to identify the strengths and weaknesses in tactical doctrine, training, leadership, and systems. Development methodology can be used in production of ARTEPs/AMTPs. Will be employed as model for JRTC measurement system.

User POC: ARI/CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. Nancy Atwood, AV 878-5619

4. SYSTEMS INTEGRATION OF HOME STATION AND ACTF

a. Determinants of Effective Unit Performance at the NTC

Description: A five year contract for analysis of home station factors related to unit and leader effectiveness at the NTC. Will include examination of home station training, cohesion, leadership, and individual soldier factors. Data on these factors will be entered into a data base where they can be systematically analyzed and compared with unit task and mission performance at the NTC.

Utilization: This contract will permit, for the first time, the determination of the status and interactions of major individual and organizational factors in units at their home stations, and their relationships to unit and leader performance in the high quality combat simulation provided by the NTC. The results will have major implications for Army decision makers, policies, and procedures at all levels.

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. James Banks, AV 878-5316

b. A Methodology for Identifying, Collecting and Measuring Pre/Post NTC Home Station Training Factors That Contribute to Maximizing the NTC Training Learning Experience

Description: This report describes the methodology, and results of a pilot test of that methodology, for investigating the home station training factors that are postulated to have an effect upon unit performance at the NTC. It also presents a concept for investigating post-NTC home station factors that allow for maximum application of lessons learned from the NTC training experience

Utilization: This product will be used as a framework for performing the investigation of home station factors that affect NTC performance and for developing a methodology for collecting and analyzing post-NTC home station factors that allow for the maximum application of NTC lessons learned.

User POC: CATA (LTC Coon, AV 552-2438)

POC: Dr. Nancy Atwood, AV 878-5619

c. Utilization of NTC Take Home Packages by Units at Home Station

Description: This project will identify primary home station users and potential users of information from the NTC, how the information from the Take Home Packages is presently being used, and recommendations for future modifications to enhance the quality and utility of feedback from the NTC.

Utilization: The GAO investigations of the NTC asserted that units going to the NTC were continuing to show weaknesses in the same areas as earlier units, that the Take Home Packages were not being used, and that the Army was not doing enough to correct deficiencies in the force. This project will determine present state of utilization of Take Home Packages, reasons for usage and nonusage, and recommendations for improvement. Utilization will be by CATA for development of Lessons Learned and for TRADOC development of training support materials, and by the NTC Operation Group for improved unit feedback.

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. James Banks, AV 878-5316

5. SUPPORT OF TRAINING.

a. Historical Review of the NTC Written Take Home Package (1981-1986)

Description: Documents the evolution of the written take home package from 1981-1986. Includes current NTCIS support capabilities and suggested enhancements

Utilization: To be used as background material for future development of NTC THPs

User POC: NTC Operations Group (LTC Heimgartner, AV 470-5083)

ARI POC: Dr. Nancy Atwood, AV 878-5619

b. The AAR at the National Training Center

Description: Documents the evolution and development of the NTC AAR. Compares the NTC AAR to the "classic" AAR developed in connection with MILES/TES and notes NTC-specific innovations

Utilization: To be used as background material for development, evaluation, and augmentation of NTC-AAR

User POC: NTC Operations Group (LTC Heimgartner, AV 470-5083)

ARI POC: Dr. Nancy Atwood, AV 878-5619

6. DATA QUALITY AND UTILITY.

a. Assistance in Development of Statement of Work for NTC Instrumentation System Upgrade

Description: Currently working with the Combined Arms Training Activity and the Directorate of Army Ranges and Targets to determine the frequency, precision, and metric for data elements to be collected through an upgrade of the current instrumentation system. This requires extracting and synthesizing requirements generated previously and refining their level of specificity.

Utilization: This will result in a Statement of Work to be provided to the contractor responsible for the NTC Instrumentation System upgrade.

User POC: CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. James Banks, AV 878-5316

b. NTC Data Handbook - 1986

Description: This document provides explicit documentation of the formats of NTC digital data sources

Utilization: It will serve as a reference to NTC digital data sources for computer systems personnel.

User POC: ARI, CATA (LTC Coon, AV 552-2438)

ARI POC: Dr. Nancy Atwood, AV 878-5619

c. Rules for Identification of Format and Content of NTC OPLANS and Automation Design

Description: Rules for Abstracting Critical Information and Strategies for automating location and summary.

Utilization: Will be built into the integrated database of the Combat Analysis Laboratory at ARI Presidio of Monterey, the CATA-designated repository for NTC data to facilitate access and analysis of paper-based 86 data.



User POC: CATA, (LTC Coon, AV 552-2438)

POC: Dr. Dwight Goehring, AV 878-5619